

1    CLAIMS

2    We claim:

- 3    1. A method for digitally processing transform data  
4       representing a phenomenon, the method comprising:  
5       performing an inverse transform of said transform data  
6       to the real domain forming high-precision numbers;  
7       and  
8       manipulating said high-precision numbers to produce an  
9       effect.
- 10   2. A method as recited in claim 1, further comprising  
11       converting said high-precision numbers to integers and  
12       clipping the integers to an allowed range forming  
13       converted data.
- 14   3. A method as recited in claim 1, wherein the phenomenon is  
15       an image.
- 16   4. A method as recited in claim 1, wherein said effect is  
17       the chroma-key merging of two data sets.
- 18   5. A method as recited in claim 1, wherein said effect is  
19       the color correction of image data.
- 20   6. A method as recited in claim 3, wherein said effect is a  
21       90 degree rotation of the image.
- 22   7. A method as recited in claim 1, wherein said  
23       high-precision numbers are floating point numbers.
- 24   8. A method as recited in claim 1, wherein said  
25       high-precision numbers are fixed precision numbers  
26       including a fractional part.

- 1    9. A method as recited in claim 1, wherein the step of  
2        performing employs an inverse discrete cosine  
3        transform.
- 4    10. A method as recited in claim 1, wherein the step of  
5        performing employs an inverse discrete wavelet  
6        transform.
- 7    11. A method as recited in claim 1, wherein the step of  
8        performing employs an inverse discrete Fourier  
9        transform.
- 10   12. A method for digitally processing transform data in the  
11        real domain representing a phenomenon, the method  
12        comprising:  
13            performing an inverse transform of said transform data  
14                to the real domain forming high-precision numbers;  
15            and  
16            performing a forward transform of said high-precision  
17            numbers.
- 18   13. A method as recited in claim 12, wherein the inverse to  
19        said forward transform is different from said inverse  
20        transform.
- 21   14. A method as recited in claim 13, wherein said forward  
22        transform is a forward discrete cosine transform and  
23        said inverse transform is an inverse discrete wavelet  
24        transform.
- 25   15. A method as recited in claim 1, further comprising  
26        implementing an inverse quantization of transform-coded  
27        data forming the transform data.

- 1    16. A method as recited in claim 15, further comprising  
2        converting said high-precision numbers to integers and  
3        clipping the integers to an allowed range forming  
4        converted data.
- 5    17. A method as recited in claim 15, further comprising  
6        entropy decoding coded data to form the transform-coded  
7        data
- 8    18. A method as recited in claim 17, wherein said coded data  
9        are coded image data.
- 10   19. A method as recited in claim 17, wherein said coded data  
11        are coded video data.
- 12   20. A method as recited in claim 18, wherein said coded  
13        image data are in a JPEG still image international  
14        standard format.
- 15   21. A method as recited in claim 19, wherein said coded  
16        video data are in a MPEG motion video international  
17        standard format.
- 18   22. A method as recited in claim 15, wherein the step of  
19        performing employs an inverse discrete cosine  
20        transform.
- 21   23. A method as recited in claim 15, wherein the step of  
22        performing employs an inverse discrete wavelet  
23        transform.
- 24   24. A method as recited in claim 15, wherein the step of  
25        performing employs an inverse discrete Fourier  
26        transform.

- 1 25. A method as recited in claim 15, wherein said  
2 high-precision numbers are fixed precision numbers that  
3 include a fractional part.
- 4 26. A method as recited in claim 12, further comprising  
5 manipulating said high-precision numbers to produce an  
6 effect.
- 7 27. A method for digitally processing transform-coded data  
8 representing a phenomenon, the method comprising:  
9 performing an inverse quantization of the  
10 transform-coded data forming transform data;  
11 performing an inverse transform of said transform data  
12 to the real domain forming high-precision numbers;  
13 performing a forward transform of said high-precision  
14 numbers forming forward transformed data; and  
15 performing a quantization of said forward transformed  
16 data forming quantized data.
- 17 28. A method as recited in claim 27, further comprising:  
18 entropy decoding coded data forming transform-coded  
19 data employing entropy decode; and  
20 entropy encoding the quantized data employing entropy  
21 encode forming encoded data.
- 22 29. A method as recited in claim 27, further comprising  
23 manipulating said high-precision numbers to produce an  
24 effect.
- 25 30. A method as recited in claim 27, further comprising  
26 converting said high-precision numbers to integers and  
27 clipping to an allowed range forming converted data.

- 1 31. A method as recited in claim 29, further comprising  
2 alternating manipulating steps with the steps of  
3 performing a forward transform, performing a  
4 quantization, entropy encoding, entropy decoding,  
5 performing an inverse quantization, and performing an  
6 inverse transform a desired number of times.
- 7 32. A method as recited in claim 31, wherein said coded data  
8 are compressed data, and each step of alternating  
9 implements a compression/decompression cycle.
- 10 33. A system employing the method recited in claim 31,  
11 wherein each step of alternating recompresses and  
12 decompresses coded data to enable an editing operation.
- 13 34. A method as recited in claim 28, wherein said coded data  
14 are coded audio data.
- 15 35. A method as recited in claim 28, wherein said coded data  
16 are coded electromagnetic environment data.
- 17 36. A method as recited in claim 28, wherein said coded data  
18 are coded video data.
- 19 37. A method as recited in claim 28, wherein said coded data  
20 is encoded in the JPEG standard format.
- 21 38. A system for digitally processing first level  
22 transform-coded data in the real domain representing a  
23 phenomenon, the system comprising:  
24 a first inverse quantizer to generate transform data  
25 from said transform-coded data;  
26 a first inverse transformer to produce an inverse  
27 transform of said transform data to the real  
28 domain forming high-precision numbers;

- 1       a first forward transformer for forward transforming  
2       said high-precision numbers forming forward  
3       transformed data; and  
4       a first quantizer for quantizing said forward  
5       transformed data to form quantized data.
- 6   39. A system as recited in claim 38, wherein the forward  
7       transformer employs a different transform type than a  
8       first transform type employed by the inverse  
9       transformer.
- 10   40. A system as recited in claim 38, wherein said forward  
11       transformer produces a forward discrete cosine  
12       transform and said inverse transformer produces an  
13       inverse discrete wavelet transform.
- 14   41. A system as recited in claim 38, further comprising:  
15       a manipulator for manipulating the high-precision  
16       numbers to produce an effect.
- 17   42. A system as recited in claim 38, wherein said inverse  
18       quantizer and said quantizer use identical quantization  
19       values.
- 20   43. A system as recited in claim 41, wherein only a subset  
21       of the quantized transform data produced different  
22       transform-coded data.
- 23   44. A system as recited in claim 38, wherein said inverse  
24       quantizer and said quantizer use at least one different  
25       quantization value.
- 26   45. A system as recited in claim 38, further comprising:

- 1        an entropy decoder to form the transform-coded data  
2                from coded data; and  
3        an entropy encoder to encode the quantized data.
- 4    46. A system for digitally processing transform data  
5        representing a phenomenon, the system comprising:  
6        an inverse transformer to perform an inverse transform  
7                of the transform data to the real domain using  
8                high-precision numbers; and  
9        a manipulator to manipulate the high-precision numbers  
10                to produce an effect.
- 11    47. A system as recited in claim 46, further comprising a  
12        converter to convert said high-precision numbers to  
13        integers, and a clipper to clip the integers to an  
14        allowed range.
- 15    48. A system for digitally processing transform-coded data  
16        representing a phenomenon, the system comprising:  
17        an inverse quantizer to perform an inverse quantization  
18                of said transform-coded data to form transform  
19                data;  
20        an inverse transformer to perform an inverse transform  
21                of said transform data to the real domain forming  
22                high-precision numbers; and  
23        a manipulator for manipulating the high-precision  
24                numbers to produce an effect.
- 25    49. A system as recited in claim 48, further comprising a  
26        converter to convert said high-precision numbers to

1 integers, and a clipper to clip the integers to an  
2 allowed range.

3 50. A system for digitally processing transform data in the  
4 real domain representing a phenomenon, the system  
5 comprising:

6 an inverse transformer to produce an inverse transform  
7 of the transform data to the real domain to form  
8 high-precision numbers; and

9 a forward transformer to forward transform the  
10 high-precision numbers.

11 51. A system as recited in claim 50, further comprising:

12 a manipulator to manipulate the high-precision numbers  
13 to produce an effect.

14 52. A system as recited in claim 41, wherein the quantized  
15 data forms an other level of transform-coded data and  
16 further comprising:

17 another inverse quantizer, another inverse transformer,  
18 another manipulator, another forward transformer,  
19 and another quantizer to perform together a  
20 similar function on the other level of  
21 transform-coded data as performed on the first  
22 level transform-coded data.

23 53. A system as recited in claim 52, wherein the effect  
24 produced by the first manipulator is a different type  
25 of effect from that produced by the other manipulator.

26 54. A system as recited in claim 52, wherein the functions  
27 of the first inverse quantizer, first inverse  
28 transformer, first forward transformer, and first



1 quantizer, and the respective functions of said another  
2 inverse quantizer, another inverse transformer, another  
3 forward transformer, and another quantizer are each  
4 performed by a same module.

5 55. A method as recited in claim 2, further comprising  
6 providing said converted data for use by an output  
7 device.

8 56. A method as recited in claim 55, wherein the output  
9 device is a display monitor.

10 57. A method as recited in claim 55, wherein the output  
11 device is a raster display monitor.

12 58. A method as recited in claim 1, wherein the transform  
13 data includes information of a spectral analysis.

14 59. An article of manufacture comprising a computer usable  
15 medium having computer readable program code means  
16 embodied therein for digitally processing transform  
17 data representing a phenomenon, the computer readable  
18 program code means in said article of manufacture  
19 comprising computer readable program code means for  
20 causing a computer to effect:

21 performing an inverse transform of said transform data  
22 to the real domain forming high-precision numbers;  
23 and

24 manipulating said high-precision numbers to produce an  
25 effect.

26 60. An article of manufacture as recited in claim 59, the  
27 computer readable program code means in said article of  
28 manufacture further comprising computer readable

1        program code means for causing a computer to effect  
2        converting said high-precision numbers to integers and  
3        clipping the integers to an allowed range forming  
4        converted data.

5        61. An article of manufacture as recited in claim 59,  
6        wherein the phenomenon is an image.

7        62. A computer program product comprising a computer usable  
8        medium having computer readable program code means  
9        embodied therein for digitally processing transform  
10       data in the real domain representing a phenomenon, the  
11       computer readable program code means in said computer  
12       program product comprising computer readable program  
13       code means for causing a computer to effect:  
14       performing an inverse transform of said transform data  
15       to the real domain forming high-precision numbers;  
16       and  
17       performing a forward transform of said high-precision  
18       numbers.

19       63. A computer program product as recited in claim 62,  
20       wherein the inverse to said forward transform is  
21       different from said inverse transform.

22       64. A computer program product as recited in claim 62,  
23       wherein said forward transform is a forward discrete  
24       cosine transform and said inverse transform is an  
25       inverse discrete wavelet transform.

26       65. A program storage device readable by machine, tangibly  
27       embodying a program of instructions executable by the  
28       machine to perform method steps for digitally

1       processing transform-coded data representing a  
2       phenomenon, said method steps comprising:  
3       performing an inverse quantization of said  
4       transform-coded data forming transform data;  
5       performing an inverse transform of said transform data  
6       to the real domain forming high-precision numbers;  
7       and  
8       manipulating said high-precision numbers to produce an  
9       effect.

10   66. A computer program product as recited in claim 65, the  
11       computer readable program code means in said computer  
12       program product further comprising converting said  
13       high-precision numbers to integers and clipping the  
14       integers to an allowed range forming converted data.

15   67. A program storage device readable by machine, tangibly  
16       embodying a program of instructions executable by the  
17       machine to perform method steps for digitally  
18       processing transform-coded data representing a  
19       phenomenon, said method steps comprising:  
20       performing an inverse quantization of the  
21       transform-coded data forming transform data;  
22       performing an inverse transform of said transform data  
23       to the real domain forming high-precision numbers;  
24       performing a forward transform of said high-precision  
25       numbers forming forward transform data; and  
26       performing a quantization of said forward transformed  
27       data forming quantized data.

- 1 68. A program storage device readable by machine as recited  
2 in claim 67, said method steps further comprising  
3 manipulating said high-precision numbers to produce an  
4 effect.
- 5 69. A program storage device readable by machine as recited  
6 in claim 67, said method steps further comprising  
7 converting said high-precision numbers to integers and  
8 clipping to an allowed range forming converted data.
- 9 70. A program storage device readable by machine as recited  
10 in claim 67, said method steps further comprising:  
11 entropy decoding coded data forming transform-coded  
12 data employing entropy decode; and  
13 entropy encoding the quantized data employing lossless  
14 entropy encode forming encoded data.
- 15 71. A program storage device readable by machine as recited  
16 in claim 70, said method steps further comprising  
17 alternating said manipulating steps with said steps of  
18 performing a forward transform, performing a  
19 quantization, entropy encoding, entropy decoding,  
20 performing an inverse quantization, and performing an  
21 inverse transform a desired number of times.
- 22 72. A program storage device readable by machine as recited  
23 in claim 71, wherein said coded data are compressed  
24 data, and each step of alternating implements a  
25 compression/decompression cycle.
- 26 73. A program storage device readable by machine as recited  
27 in claim 70, wherein the phenomenon is image data  
28 encoded in the JPEG standard format.

- 1 74. A method for digitally processing transform data in the  
2 real domain representing a phenomenon, the method  
3 comprising:  
4 performing an inverse transform of said transform data  
5 to the real domain forming high-precision numbers;  
6 converting the high-precision numbers to integers which  
7 include out of range data; and  
8 performing a forward transform of the integers forming  
9 forward transformed data.
- 10 75. A method as recited in claim 74, further comprising  
11 manipulating the integers to produce an effect.
- 12 76. A method as recited in claim 74, further comprising:  
13 performing an inverse quantization of transform-coded  
14 data to form the transform data; and  
15 performing a quantization of said forward transformed  
16 data forming quantized data.
- 17 77. A method as recited in claim 74, further comprising  
18 clipping the integers to an allowed range forming  
19 converted data.
- 20 78. A method as recited in claim 76, further comprising  
21 alternating manipulating steps with the steps of  
22 performing a forward transform, performing a  
23 quantization, performing an inverse quantization, and  
24 performing an inverse transform a desired number of  
25 times.
- 26 79. A program storage device readable by machine, tangibly  
27 embodying a program of instructions executable by the

- 1 machine to perform method steps for digitally  
2 processing transform data in the real domain  
3 representing a phenomenon, said method steps  
4 comprising:  
5 performing an inverse transform of said transform data  
6 to the real domain forming high-precision numbers;  
7 converting the high-precision numbers to integers which  
8 include out of range data; and  
9 performing a forward transform of the integers forming  
10 forward transformed data.
- 11 80. A program storage device readable by machine, as recited  
12 in claim 79, further comprising manipulating the  
13 integers to produce an effect.
- 14 81. A program storage device readable by machine, as recited  
15 in claim 79, further comprising performing an inverse  
16 quantization of transform-coded data to form the  
17 transform data.
- 18 82. A program storage device readable by machine, as recited  
19 in claim 79, further comprising performing a  
20 quantization of said forward transformed data forming  
21 quantized data.
- 22 83. A program storage device readable by machine, as recited  
23 in claim 79, further comprising clipping the integers  
24 to an allowed range forming converted data.
- 25 84. A method as recited in claim 17, wherein said coded data  
26 are coded audio data.  
27